

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
3 June 2004 (03.06.2004)

PCT

(10) International Publication Number  
**WO 2004/046744 A1**

(51) International Patent Classification<sup>7</sup>: **G01R 33/385**

(74) Agent: WOLFS, Marc, J., M.; Philips Intellectual Property & Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:  
PCT/IB2003/004816

(22) International Filing Date: 27 October 2003 (27.10.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
02079768.4 15 November 2002 (15.11.2002) EP

(71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

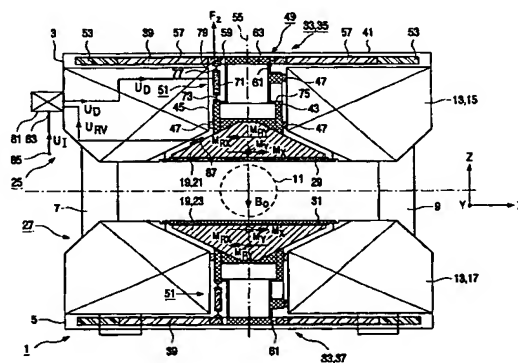
(75) Inventors/Applicants (for US only): **ROOZEN, Nicolaas, B.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **HAM, Cornelis, L., G.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **HARVEY, Paul, R.** [GB/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **LIMPENS, Patrick, W., P.** [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

#### Declaration under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,

[Continued on next page]

(54) Title: MRI SYSTEM HAVING A GRADIENT MAGNET SYSTEM WITH A BALANCE MEMBER



(57) Abstract: The invention relates to a magnetic resonance imaging (MRI) system (1) comprising an examination volume (11), a main magnet system (13) for generating a main magnetic field ( $B_0$ ) in the examination volume in a Z-direction, a gradient magnet system (19) for generating gradients of the main magnetic field, and an anti-vibration system (33) for reducing vibrations of the gradient magnet system caused by a mechanical load ( $M_x$ ,  $M_y$ ) exerted on the gradient magnet system as a result of electromagnetic interaction between the main magnetic field and electrical currents in the gradient magnet system. According to the invention the anti-vibration system (33) comprises a balance member (39), which is coupled to the gradient magnet system (19) by means of an actuator system (51) and a coupling device (49) allowing displacements of the balance member relative to the gradient magnet system. The MRI system (1) also has a control system (81) which controls the actuator system in such a manner that the actuator system exerts upon the balance member a compensating mechanical load ( $M_{cx}$ ,  $M_{cy}$ ) which substantially corresponds to the mechanical load ( $M_x$ ,  $M_y$ ) exerted on the gradient magnet system. As a result, the actuator system exerts a mechanical reaction load ( $M_{rx}$ ,  $M_{ry}$ ) on the gradient magnet system which has the same magnitude as but is oppositely directed to the mechanical load ( $M_x$ ,  $M_y$ ) exerted on the gradient magnet system, so that vibrations of the gradient magnet system are effectively limited.